Cisco Aironet 9.5-dBi Patch Antenna (AIR-ANT5195P-R)

This document outlines the specifications, describes the AIR-ANT5195P-R 9.5-dBi patch antenna, and provides instructions for mounting it. The antenna operates in the 5-GHz frequency range and is designed for use in both indoor and outdoor environments.

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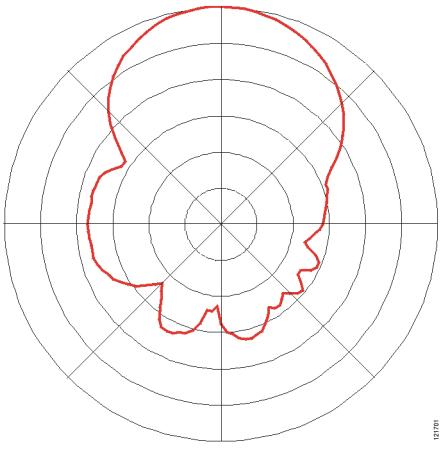
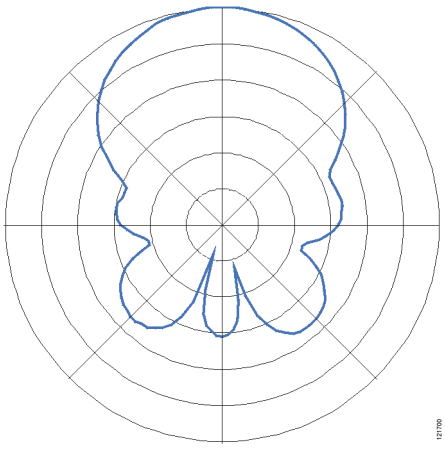
Technical Specifications

Antenna type	2 x 2 Patch array
Operating frequency range	5150–5850 MHz
Nominal input impedance	50Ω
Peak gain	9.5 dBi
Polarization	Linear, vertical
E-plane 3-dB beamwidth	43
H-plane 3-dB beamwidth	50
Sidelobe level	<–20 dBc
Front-to-back ratio	>20 dB
Cable length and type	36 in. (91.4 cm) Plenum rated, UV stable
Connector type	RP-TNC Male
Length	5.1 in. (12.9 cm)
Width	5.1 in. (12.9 cm)
Height	1.0 in. (2.5 cm)
Weight	10 oz. (0.2 kg)
Operating temperature range	–22 F to 158 F (–30 C to 70 C)
Storage temperature range	–40 F to 185 F (–40 C to 85 C)

E-Plane Pattern



H-Plane Pattern



System Requirements

This antenna is designed for use with Cisco Aironet access points and bridges but can be used with any 5-GHz Cisco Aironet radio device that uses an RP-TNC connector.

Safety Precautions

Warning **Installation of this antenna near power lines is dangerous. For your safety, follow the installation directions.**

Warning **This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.**

Warning **In order to comply with international radio frequency (RF) exposure limits, dish antennas should be located at a minimum of 8.7 inches (22 cm) or more from the bodies of all persons. Other antennas should be located a minimum of 7.9 inches (20 cm) or more from the bodies of all persons.**

Warning **Do not work on the system or connect or disconnect cables during periods of lightning activity.**

Warning **This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.**

Warning **Do not locate the antenna near overhead power lines or other electric light or power circuits, or where it can come into contact with such circuits. When installing the antenna, take extreme care not to come into contact with such circuits, as they may cause serious injury or death. For proper installation and grounding of the antenna, please refer to national and local codes (e.g. U.S.:NFPA 70, National Electrical Code, Article 810, in Canada: Canadian Electrical Code, Section 54).**

Each year hundreds of people are killed or injured when attempting to install an antenna. In many of these cases, the victim was aware of the danger of electrocution, but did not take adequate steps to avoid the hazard.

For your safety, and to help you achieve a good installation, please read and follow these safety precautions. **They may save your life!**

1. If you are installing an antenna for the first time, for your own safety as well as others, seek professional assistance. Your Cisco sales representative can explain which mounting method to use for the size and type antenna you are about to install.
2. Select your installation site with safety, as well as performance in mind. Remember: electric power lines and phone lines look alike. For your safety, assume that any overhead line can kill you.

3. Call your electric power company. Tell them your plans and ask them to come look at your proposed installation. This is a small inconvenience considering your life is at stake.
4. Plan your installation carefully and completely before you begin. Successful raising of a mast or tower is largely a matter of coordination. Each person should be assigned to a specific task, and should know what to do and when to do it. One person should be in charge of the operation to issue instructions and watch for signs of trouble.
5. When installing your antenna, remember:
   a. **Do not** use a metal ladder.
   b. **Do not** work on a wet or windy day.
   c. **Do** dress properly—shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.
6. If the assembly starts to drop, get away from it and let it fall. Remember, the antenna, mast, cable, and metal guy wires are all excellent conductors of electrical current. Even the slightest touch of any of these parts to a power line complete an electrical path through the antenna and the installer: **you!**
7. If any part of the antenna system should come in contact with a power line, **don't touch it or try to remove it yourself. Call your local power company**. They will remove it safely.
8. If an accident should occur with the power lines call for qualified emergency help immediately.

Installation Guidelines

Because the antennas transmit and receive radio signals, they are susceptible to RF obstructions and common sources of interference that can reduce throughput and range of the device to which they are connected. Follow these guidelines to ensure the best possible performance:

- Mount the antenna to take advantage its propagation characteristics. Mount it as high as possible and oriented so that the cables are pointing down (towards the ground).
- Keep the antenna away from metal obstructions such as heating and air-conditioning ducts, large ceiling trusses, building superstructures, and major power cabling runs. If necessary, use a rigid conduit to lower the antenna away from these obstructions.
- The density of the materials used in a building's construction determines the number of walls the signal must pass through and still maintain adequate coverage. Consider the following before choosing the location in which to install your antenna:
  - Paper and vinyl walls have very little affect on signal penetration.
  - Solid and pre-cast concrete walls limit signal penetration to one or two walls without degrading coverage.
  - Concrete and wood block walls limit signal penetration to three or four walls.
  - A signal can penetrate five or six walls constructed of drywall or wood.
  - A thick metal wall causes signals to reflect, causing poor penetration.
- Install the antenna away from 5-GHz cordless phones. These products can cause signal interference because they operate in the same frequency range as the device your antenna is connected to.

Site Selection

Before attempting to install your antenna, determine where you can best place the antenna for safety and performance.

Follow these steps to determine a safe distance from wires, power lines, and trees.

Step 1 Measure the height of your antenna.

Step 2 Add this length to the length of your tower or mast and then double this total for the minimum recommended safe distance.

Caution If you are unable to maintain this safe distance, stop and get professional help.

Generally, the higher an antenna is above the ground, the better it performs. Good practice is to install your antenna about 5 to 10 ft (1.5 to 3 m) above the roof line and away from all power lines and obstructions. If possible, find a mounting place directly above your wireless device so that the lead-in cable can be as short as possible.

Installing the Antenna

You can install the antenna on any flat vertical surface or on a mast using the mast mounting kit. An articulated mast mounting kit is also available. Hardware for mounting the antenna on drywall is provided. If you intend to install your antenna on another surface, you must provide the appropriate hardware.

Tools and Equipment Required

An installation kit is shipped with the antenna and consists of the following hardware:

- Four #8 x 1 -in. sheet metal screws
- Four screw caps
- Four screw cap washers

You need the following tools and equipment, which are not provided.

- A #2 Phillips screwdriver
- A drill
- A 3/16-in. (4.8 mm) drill bit (for drywall installation; other surfaces may require a different size)
- A pencil
- A small mallet or hammer

The following sections contain typical procedures for installing the antenna on a vertical surface or a mast. Your installation may vary. Before you begin, you may want to refer to Figure 1.

Mounting on a Vertical Surface

Follow these steps to mount your antenna on a vertical surface. This procedure describes mounting the antenna on a drywall surface. If you are mounting the antenna on any other type of surface, your procedure may vary slightly.

Step 1 Determine the location in which you will mount the antenna.

Step 2 Use the antenna as a template to mark the locations of the four mounting holes with a pencil.

Step 3 Use a drill and 3/16-in. (4.8 mm) drill bit to drill four holes at the locations you marked in Step 2.

Step 4 Start a plastic anchor into each hole.

Step 5 Use a mallet or small hammer to seat the anchors into the wall.

Step 6 Align the antenna's mounting holes with the anchors.

Caution The back of the antenna has an orientation marking. Make sure the antenna is mounted according to the marking. If the antenna is not mounted properly, degraded performance could result.

Step 7 Put a screw cap washer onto a #8 screw and start the screw into each antenna mounting hole.

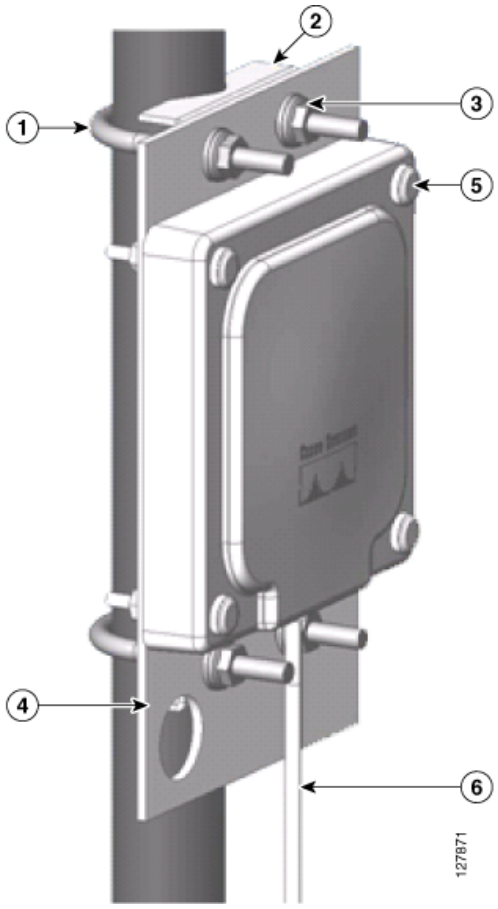
Step 8 Use a Phillips screwdriver to secure the antenna to the wall. Do not overtighten.

Step 9 Install the screw caps onto the screw cap washers.

Mounting on a Mast

The antenna can be mounted on a mast using an optional mast mounting kit as shown in Figure 1.

Figure 1 Optional Mast Mount



1	-20 u-bolt	**4**	Mounting plate
2	Support bracket	**5**	#8-32 x 1- machine screws and screw cap washers
3	-in. flat washers and -20 nuts	**6**	Antenna cable

Follow these steps to mount the antenna on a mast.

Step 1 Place one -20 u-bolt around the mast, and place one support bracket on the u-bolt.

Step 2 Place the mounting plate on the u-bolt.

Step 3 Place two -inch flat washers and -20 nuts on the ends of the u-bolt. Tighten the nuts finger tight.

Step 4 Repeat steps 1 through 3 for the other u-bolt.

Step 5 Position the mounting plate on the mast in the direction the antenna should face and tighten the u-bolt nuts with a 7/16-in. (11-mm) wrench.

Step 6 Position the antenna on the mounting plate.

Step 7 Place the screw cap washers onto the four #8-32 x 1- -in. machine screws.

Step 8 Install the screws through the antenna mounting plate and install the #8 nuts.

Step 9 Tighten the #8 screws and nuts with a #2 Phillips screwdriver and an 11/32-in. (9-mm) wrench.

Caution Do not overtighten the nuts. You could damage the antenna.

Step 10 Install the screw caps onto the screw cap washers.

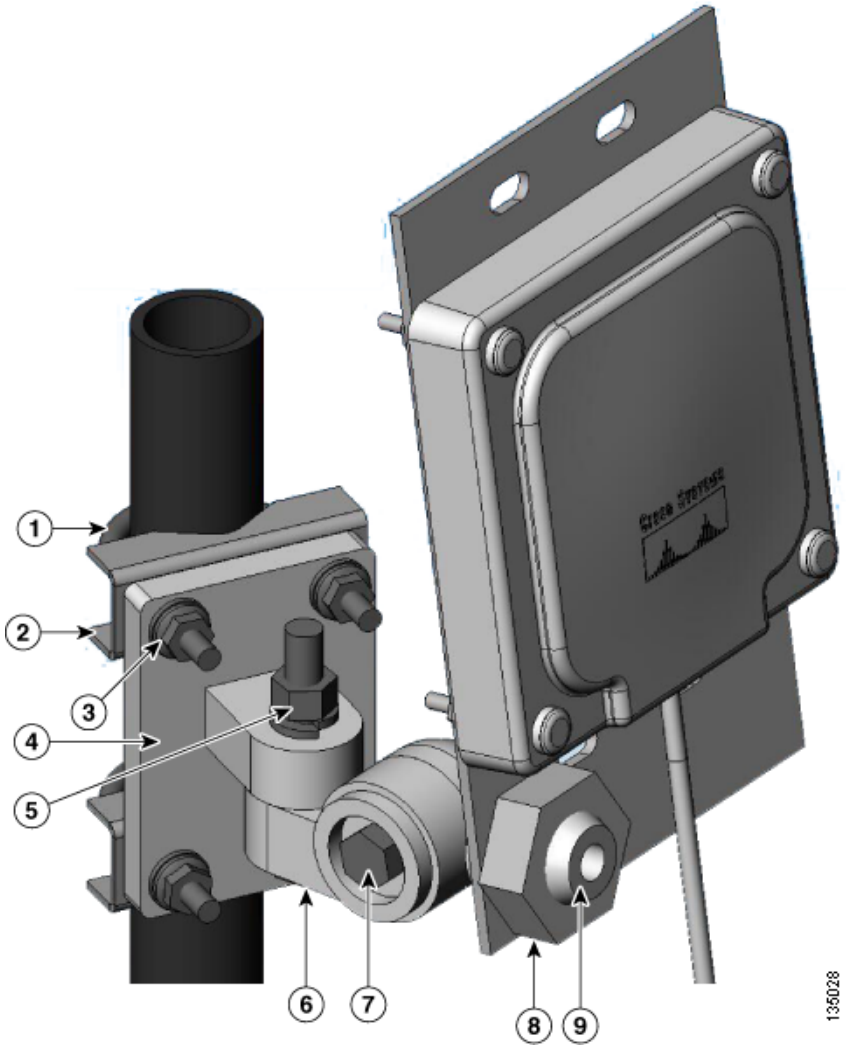
Step 11 Route the antenna cable to the wireless device.

Note Cisco recommends grounding the antenna. See the "Grounding the Antenna" section on page 11 for details.

Installing the Articulated Mount

The antenna can also be mounted on an optional articulated mounting device as shown in Figure 2. The articulated mount is used with the mast mount to provide a way to adjust the antenna elevation and azimuth through a limited range.

Figure 2 Articulated Mount Details



1	u-bolt	**6**	Knuckle
2	Support bracket	**7**	Elevation adjustment bolt
3	-20 nut and flat washer	**8**	Stud nut
4	Articulated mount base	**9**	Stud
5	Azimuth adjustment nut and lockwasher		

Figure 2 shows the articulated mount installed on a mast. You can also install it on any suitable flat surface.

Follow these steps to install the articulated mount on a mast:

Step 1 Place one -20 u-bolt around the mast, and place one support bracket on the U-bolt.

Step 2 Place the articulated mounting base on the u-bolt.

Step 3 Place two -in. flat washers and -20 nuts on the ends of the u-bolt. Tighten the nuts finger tight.

Step 4 Repeat Steps 1 through 3 for the other u-bolt.

Step 5 Position the mounting plate on the mast in the direction the antenna should face and tighten the u-bolt nuts with a 7/16-in. (11-mm) wrench.

Step 6 Use the elevation adjustment bolt to install the knuckle assembly on the articulated mount base.

Step 7 Install a lock washer and nut onto the elevation adjustment bolt. Tighten the nut finger tight.

Note You may want to install the antenna on its antenna mounting plate before proceeding to the next step. If so, skip Step 10 of this procedure and perform Steps 6 through 9 in the "Mounting on a Mast" section on page 7

Step 8 Position the antenna mounting plate on the articulating mount stud.

Step 9 Start the stud nut onto the articulating mount stud. Tighten the nut hand tight. Be careful not to overtighten the nut as the stud is made of plastic.

Step 10 Install the antenna on the antenna mounting plate.

Step 11 Use the azimuth and elevation adjustments to fine tune the antenna's azimuth and elevation.

Step 12 When the antenna is properly adjusted, use a 9/16 in. wrench to tighten the azimuth and elevation adjustment nuts. Do not overtighten.

Step 13 Route the antenna cable to the wireless device.

Note Cisco recommends grounding the antenna. See the "Grounding the Antenna" section on page 11 for details.

Caution If you install additional lengths of antenna cable, be sure to install a suitable strain relief. The antenna may be damaged if you do not eliminate the extra weight of the cable. The antenna is not designed to support the weight of a cable longer than the installed 3-ft (91.4 cm) cable.

Antenna Cable Information

Note Coaxial cable loses efficiency as the frequency increases, resulting in signal loss. The cable should be kept as short as possible because cable length also causes signal loss (the longer the run, the greater the loss).

Note The antenna cable has a 0.5 in. (12.7 mm) bend radius. Sharply bending or crimping the cable may cause a degredation in performance.

The antenna terminates with a RP-TNC plug after a short, 3-ft (0.91-m) cable. The mating connector to the antenna is an appropriate RP-TNC jack. The connector on the opposite end will vary according to the type of equipment used.

After the cable is attached to the antenna, make sure that the connections are sealed (if outdoors) to prevent moisture and other weathering elements from affecting performance. Cisco recommends using a coax seal (such as CoaxSeal) for outdoor connections. Silicone sealant or electrical tape are **not** recommended for sealing outdoor connections.

Grounding the Antenna

Follow these steps to ground the antenna in accordance with national electrical code instructions.

Step 1 Use No. 10 AWG copper or No. 8 or larger copper-clad steel or bronze wire as ground wires for both mast and lead-in. Securely clamp the wire to the bottom of the mast.

Step 2 Secure the lead-in wire to an antenna discharge unit and the mast ground wire to the building with stand-off insulators spaced from 4 ft (1.2 m) to 8 ft (2.4 m) apart.

Step 3 Mount the antenna discharge unit as close as possible to where the lead-in wire enters the building.

Step 4 Drill a hole in the building's wall as close as possible to the equipment to which you will connect the lead-in cable.

Caution There may be wires in the wall. Make sure your drilling location is clear of any obstructions or other hazards.

Step 5 Pull the cable through the hole and form a drip loop close to where it enters the building.

Step 6 Thoroughly waterproof the lead-in area.

Step 7 Install a lightning arrestor.

Step 8 Connect the lead-in cable to the equipment.

Obtaining Documentation

Cisco documentation and additional literature are available on Cisco.com. Cisco also provides several ways to obtain technical assistance and other technical resources. These sections explain how to obtain technical information from Cisco Systems.

Cisco.com

You can access the most current Cisco documentation at this URL:

http://www.cisco.com/univercd/home/home.htm

You can access the Cisco website at this URL:

http://www.cisco.com

You can access international Cisco websites at this URL:

http://www.cisco.com/public/countries_languages.shtml

Documentation DVD

Cisco documentation and additional literature are available in a Documentation DVD package, which may have shipped with your product. The Documentation DVD is updated regularly and may be more current than printed documentation. The Documentation DVD package is available as a single unit.

Registered Cisco.com users (Cisco direct customers) can order a Cisco Documentation DVD (product number DOC-DOCDVD=) from the Ordering tool or Cisco Marketplace.

Cisco Ordering tool:

http://www.cisco.com/en/US/partner/ordering/

Cisco Marketplace:

http://www.cisco.com/go/marketplace/

Ordering Documentation

You can find instructions for ordering documentation at this URL:

http://www.cisco.com/univercd/cc/td/doc/es_inpck/pdi.htm

You can order Cisco documentation in these ways:

- Registered Cisco.com users (Cisco direct customers) can order Cisco product documentation from the Ordering tool:

  http://www.cisco.com/en/US/partner/ordering/

- Nonregistered Cisco.com users can order documentation through a local account representative by calling Cisco Systems Corporate Headquarters (California, USA) at 408 526-7208 or, elsewhere in North America, by calling 1 800 553-NETS (6387).

Documentation Feedback

You can send comments about technical documentation to bug-doc@cisco.com.

You can submit comments by using the response card (if present) behind the front cover of your document or by writing to the following address:

Cisco Systems
Attn: Customer Document Ordering
170 West Tasman Drive
San Jose, CA 95134-9883

We appreciate your comments.

Cisco Product Security Overview

Cisco provides a free online Security Vulnerability Policy portal at this URL:

http://www.cisco.com/en/US/products/products_security_vulnerability_policy.html

From this site, you can perform these tasks:

- Report security vulnerabilities in Cisco products.
- Obtain assistance with security incidents that involve Cisco products.
- Register to receive security information from Cisco.

A current list of security advisories and notices for Cisco products is available at this URL:

http://www.cisco.com/go/psirt

If you prefer to see advisories and notices as they are updated in real time, you can access a Product Security Incident Response Team Really Simple Syndication (PSIRT RSS) feed from this URL:

http://www.cisco.com/en/US/products/products_psirt_rss_feed.html

Reporting Security Problems in Cisco Products

Cisco is committed to delivering secure products. We test our products internally before we release them, and we strive to correct all vulnerabilities quickly. If you think that you might have identified a vulnerability in a Cisco product, contact PSIRT:

- Emergencies—security-alert@cisco.com
- Nonemergencies—psirt@cisco.com

Tip We encourage you to use Pretty Good Privacy (PGP) or a compatible product to encrypt any sensitive information that you send to Cisco. PSIRT can work from encrypted information that is compatible with PGP versions 2.*x* through 8.*x*.

Never use a revoked or an expired encryption key. The correct public key to use in your correspondence with PSIRT is the one that has the most recent creation date in this public key server list:

http://pgp.mit.edu:11371/pks/lookup?search=psirt%40cisco.com&op=index&exact=on

In an emergency, you can also reach PSIRT by telephone:

- 1 877 228-7302
- 1 408 525-6532

Obtaining Technical Assistance

For all customers, partners, resellers, and distributors who hold valid Cisco service contracts, Cisco Technical Support provides 24-hour-a-day, award-winning technical assistance. The Cisco Technical Support Website on Cisco.com features extensive online support resources. In addition, Cisco Technical Assistance Center (TAC) engineers provide telephone support. If you do not hold a valid Cisco service contract, contact your reseller.

Cisco Technical Support Website

The Cisco Technical Support Website provides online documents and tools for troubleshooting and resolving technical issues with Cisco products and technologies. The website is available 24 hours a day, 365 days a year, at this URL:

http://www.cisco.com/techsupport

Access to all tools on the Cisco Technical Support Website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register at this URL:

http://tools.cisco.com/RPF/register/register.do

Note Use the Cisco Product Identification (CPI) tool to locate your product serial number before submitting a web or phone request for service. You can access the CPI tool from the Cisco Technical Support Website by clicking the **Tools & Resources** link under Documentation & Tools. Choose **Cisco Product Identification Tool** from the Alphabetical Index drop-down list, or click the **Cisco Product Identification Tool** link under Alerts & RMAs. The CPI tool offers three search options: by product ID or model name; by tree view; or for certain products, by copying and pasting **show** command output. Search results show an illustration of your product with the serial number label location highlighted. Locate the serial number label on your product and record the information before placing a service call.

Submitting a Service Request

Using the online TAC Service Request Tool is the fastest way to open S3 and S4 service requests. (S3 and S4 service requests are those in which your network is minimally impaired or for which you require product information.) After you describe your situation, the TAC Service Request Tool provides recommended solutions. If your issue is not resolved using the recommended resources, your service request is assigned to a Cisco TAC engineer. The TAC Service Request Tool is located at this URL:

http://www.cisco.com/techsupport/servicerequest

For S1 or S2 service requests or if you do not have Internet access, contact the Cisco TAC by telephone. (S1 or S2 service requests are those in which your production network is down or severely degraded.) Cisco TAC engineers are assigned immediately to S1 and S2 service requests to help keep your business operations running smoothly.

To open a service request by telephone, use one of the following numbers:

Asia-Pacific: +61 2 8446 7411 (Australia: 1 800 805 227)
EMEA: +32 2 704 55 55
USA: 1 800 553-2447

For a complete list of Cisco TAC contacts, go to this URL:

http://www.cisco.com/techsupport/contacts

Definitions of Service Request Severity

To ensure that all service requests are reported in a standard format, Cisco has established severity definitions.

Severity 1 (S1)—Your network is “down,” or there is a critical impact to your business operations. You and Cisco will commit all necessary resources around the clock to resolve the situation.

Severity 2 (S2)—Operation of an existing network is severely degraded, or significant aspects of your business operation are negatively affected by inadequate performance of Cisco products. You and Cisco will commit full-time resources during normal business hours to resolve the situation.

Severity 3 (S3)—Operational performance of your network is impaired, but most business operations remain functional. You and Cisco will commit resources during normal business hours to restore service to satisfactory levels.

Severity 4 (S4)—You require information or assistance with Cisco product capabilities, installation, or configuration. There is little or no effect on your business operations.

Obtaining Additional Publications and Information

Information about Cisco products, technologies, and network solutions is available from various online and printed sources.

- Cisco Marketplace provides a variety of Cisco books, reference guides, and logo merchandise. Visit Cisco Marketplace, the company store, at this URL:

  http://www.cisco.com/go/marketplace/

- *Cisco Press* publishes a wide range of general networking, training and certification titles. Both new and experienced users will benefit from these publications. For current Cisco Press titles and other information, go to Cisco Press at this URL:

  http://www.ciscopress.com

- *Packet* magazine is the Cisco Systems technical user magazine for maximizing Internet and networking investments. Each quarter, Packet delivers coverage of the latest industry trends, technology breakthroughs, and Cisco products and solutions, as well as network deployment and troubleshooting tips, configuration examples, customer case studies, certification and training information, and links to scores of in-depth online resources. You can access Packet magazine at this URL:

  http://www.cisco.com/packet

- *iQ Magazine* is the quarterly publication from Cisco Systems designed to help growing companies learn how they can use technology to increase revenue, streamline their business, and expand services. The publication identifies the challenges facing these companies and the technologies to help solve them, using real-world case studies and business strategies to help readers make sound technology investment decisions. You can access iQ Magazine at this URL:

  http://www.cisco.com/go/iqmagazine

- *Internet Protocol Journal* is a quarterly journal published by Cisco Systems for engineering professionals involved in designing, developing, and operating public and private internets and intranets. You can access the Internet Protocol Journal at this URL:

  http://www.cisco.com/ipj

- World-class networking training is available from Cisco. You can view current offerings at this URL:

  http://www.cisco.com/en/US/learning/index.html

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